

ENVIRONMENTAL TECHNOLOGIES

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Los Alamos Meets with Industry

On February 6, 7, and 8, industry and Department of Energy representatives from throughout the United States and abroad descended on Santa Fe, New Mexico, to attend the Environmental Stewardship Information Exchange Forum.

Sponsored and coordinated by the Environmental Management program and supported by Los Alamos National Laboratory and the Department of Energy, the forum provided industry with an opportunity to express its views and issues to Los Alamos scientists and commercialization representatives. Los Alamos took the opportunity to showcase environmental capabilities and technologies with the potential to help industry solve pressing problems.

"'Stewardship, Solutions, and Cooperation' are the hallmarks of this forum, and they are the framework upon which industry and government can build successful collaborations," noted New Mexico Governor Gary Johnson in his letter to forum attendees. "I encourage each of you to participate actively in this endeavor."

Ralph Ponce de Leon, Corporate Vice President and Director of Supply and Environmental Management for Motorola, summarized why industry must endeavor to conduct environmental stewardship. "The environment is a global issue. Consequently, products must meet international, environment-driven needs," he noted. "Varying environmental regulations across the globe will influence our competitive advantage in the world marketplace."

Throughout the forum, industry and Laboratory representatives met in the Sweeney Convention Center, where more

than 50 displays showcasing Laboratory capabilities and technologies were available for viewing and discussion. Los Alamos scientists and industry also met in breakout sessions, where an active exchange of problems, ideas, and potential solutions took place.

"Technology partnerships are about cultural integration, not cultural change," said Fred Johnson, an active director in three private corporations, including Environmental Research Systems Corporation. "The national laboratories have a wealth of knowledge and expertise—it's up to us to tap into and take advantage of this national resource."



Problem-Solving Breakout Sessions Yield an Exchange of Ideas

For the better part of an afternoon Tuesday, February 7, and the following morning, February 8, industry and Laboratory representatives spent time in a variety of breakout sessions exchanging problems, ideas, and potential solutions. Hosted and facilitated by a Los Alamos scientist, each breakout session targeted a general area, such as water characterization, air treatment, or soil characterization.

In less than two hours, industry shared its problems and concerns with Laboratory scientists; brainstorming sessions took place in which proposed solutions were discussed and action items recorded. Several potential partnerships

began in these sessions between the Laboratory and industry—the overall goal of the forum was to foster such collaborations in a working environment.

David Morris, a staff scientist in the Chemical Science and Technology Division at Los Alamos, had a goal-oriented approach toward his breakout session: “There seems to be a mismatch between what we are developing and what industry specifically needs. Los Alamos wants to talk about industry’s needs during these sessions.”

Bill Berti of DuPont noted that his company spent more than \$2 million each year trying to determine what is in soil. “I’m not just looking at it as matter,” he said. “I wish to understand the forms of the contaminants.”

In the water treatment session, several representatives from regulatory firms

encouraged industry and government to work with them. They stressed that regulators need to understand the science and the depth of the problem as much if not more than the scientists. Only then can they determine “how clean is clean.”

At several breakout sessions, members of industry began to combine the technologies that they had seen in the display area. For example, one company is interested in combining a magnetic separation device with a long-range alpha detector instrument. The long-range alpha detector detects ionized air molecules produced as alpha particles travel through the air; magnetic separation is a physical separation process based on the magnetic susceptibility of particles. Combined, these technologies provide an avenue for effective cleanup and follow-up characterization.

“These breakout sessions have helped eliminate the myth that Los Alamos and industry do not communicate. They have shown that although we may not have all the answers, we do have a pathway that leads to solutions.”

Melissa Miller,
Los Alamos National Laboratory



Laboratory Director Sig Hecker contributes to a discussion between Laboratory scientists and industry participants regarding the long-range alpha detector, which in this case is mounted on a tractor.

Industrial Ecology Attracts Forum Participants

It was standing room only at the forum's industrial ecology breakout session, in which a panel presented diverse views of the concept of industrial ecology and its role in the national agenda of sustainable futures.

"My feeling is that although industrial ecology and sustainable development are somewhat new paradigms or new buzzwords, at the Department of Energy and our national laboratories they have been priorities all along," said Jessie Harris, Deputy Assistant Secretary for Science and Technology Policy in the Office of Policy of the Department of Energy. "The definitions may have been a little bit different, but I think overall we've all been very much interested in improving the environment for our future."

One definition of industrial ecology is as follows: To understand how energy, raw materials, technology, and environmental considerations may be integrated throughout the economy such that a desirable global carrying capacity for the human species can be deliberately and rationally approached and maintained, given continued economic, cultural, and technological evolution.

"Industrial ecology seeks to link the materials, the wastes, and the activities of factories," noted Dan Kerlinsky of the University of New Mexico Medical School and a participant in the Galvin Commission. "Plants release the oxygen we need to breathe. Plants breathe in the carbon dioxide that we exhale. So there's this circularity about the relationship of plants and animals that we need to try to understand—and it's not easy to understand."

Industrial ecology provides a systems perspective to the functioning of industrial systems and provides guidance on barriers and pathways to the improvement of the environmental compatibility and sustainability of those systems. Programs in industrial ecology aim at understanding

and eliminating barriers to progress and at widening the pathways to achieve a sustainable industrial economy.

Science and technology, integrated vertically and horizontally with industrial and social systems, are the keys to an efficiently functioning industrial ecosystem. This is especially true when interacting with other countries.

"American industry is not just walking in and leaving a technology or something then coming back out," said Jessie Harris. "Many countries are very adamant about wanting to develop relationships with America. They want you to come in—they want you to be in-country. They want you to understand them, their culture, their problems."

"Sustainable development meets the needs of the present without compromising the needs of future generations."

Dan Kerlinsky,
University of New Mexico

Environmental Stewardship Information Exchange Forum

In late 1994, Los Alamos developed a number of tactical goals, one of which was “Industrial Partnerships for Sustainable Development.” The objective of this goal is to “couple the Laboratory’s innovative science and technology with selected industrial sectors, with a focus on industrial ecology/sustainable development.”

The Environmental Stewardship Information Exchange Forum is one of many steps that the Environmental Management program at Los Alamos has taken toward helping establish effective, long-lasting collaborations with industry. The forum stressed that interaction and collaboration are the keys toward successful integration.

The three-day forum began on Monday, February 6, with an informal reception at the Sweeney Convention Center in Santa Fe, New Mexico. Forum attendees had an opportunity to view more than 50 exhibits and displays showcasing environmental capabilities and technologies available at the Laboratory.

The following morning, February 7, a number of speakers outlined how environmental stewardship fits into how they conduct business. Bruce Twining, Manager of the Department of Energy’s (DOE’s) Albuquerque Operations Office, summarized how DOE fits into the collaboration equation: “DOE is willing to do its part to ensure that collaborations between industry and the national laboratories continue to become more streamlined, efficient, and easier.”

“Los Alamos continues to address the legacy of waste within DOE sites,” said Laboratory Director Sig Hecker, “and in the process we have continued to add to the science base, which in turn can be used to solve many environmental problems confronted by industry not only in the United States but across the globe.”

Both large and small businesses presented their views of environmental stewardship and how they view working with Los Alamos. Ralph Ponce de Leon, Corporate Vice President and Director of

Supply and Environmental Management at Motorola, observed that “the national laboratories bring with them the intellectual muscle to solve problems industry can’t. There are some problems we just don’t have the know-how to solve. That’s where we need their help.”

“Both industry and government must be willing to cross the imaginary line that tends to keep them apart,” said Fred Johnson, who is an active director in three private corporations. “The intellectual capital alone will yield profits, both in products and in strengthening the scientific and technological advantage of government and industry.”

During the afternoon, forum attendees met with Los Alamos scientists in breakout sessions to discuss environmental problems, outline issues, and brainstorm solutions. Breakout sessions focused on an array of topics, from industrial ecology and remediation technology development to problem-solving sessions for air, water, and soil.

The guest speaker for the evening banquet was Diana MacArthur, Chief Executive Officer of Dynamac Corporation. “The 104th Congress is preparing to debate a number of issues concerning the proper role of the federal government in promoting science and technology,” she said. “The legislative outcomes of the debates will have important and long-lasting consequences for government–private sector technology development partnerships.”

Ms. MacArthur then went on to summarize the Galvin Report and its potential impact on future collaborations between industry and government. She encouraged industry to make its voice known to the decision makers on Capital Hill.

On February 8, the forum opened to the public. Approximately 80 people and several reporters from local and regional media offices toured the exhibits. “Technical ambassadors,” scientists who volunteered to host the event, explained the purpose and advantages of the technologies on display. After the tour, several individuals commented that having technical ambassadors available to explain

the displays helped them realize that Los Alamos is a place where great science takes place.

While the public toured the exhibits, industry had an opportunity to hold private discussions with Los Alamos scientists. In the afternoon, Los Alamos hosted tours of Laboratory facilities, which included the Waste Management Engineering Test Facility and the Radionuclide Assay Facility. The forum wrapped up at the Bradbury Science Museum, where Environmental Management Director Tom Baca and representatives from Los Alamos County hosted a closing reception.

Don Panther of the Westinghouse Hanford Company and a guest speaker at the forum outlined his vision of the final outcome of the conference: “Good stewardship is coordination and collaboration between agencies.” The forum is but one crucial step toward fulfilling this vision.

“Environmental stewardship makes good business sense.”

**Ralph Ponce de Leon,
Motorola**



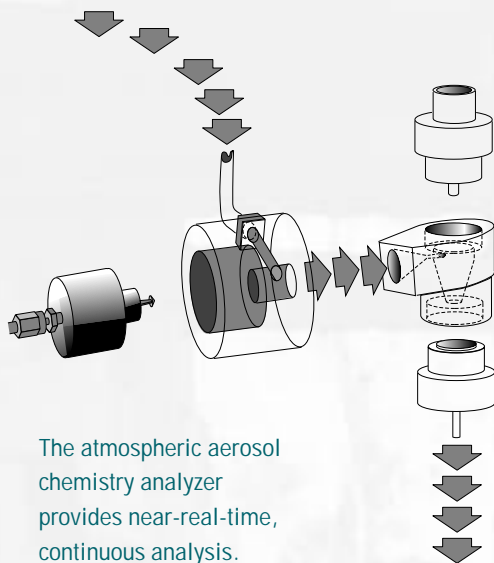
Ralph Ponce de Leon of Motorola outlines industry's perspective of environmental stewardship. Other forum speakers included (left to right) Pete Lyons (Los Alamos), Fred Johnson (Santa Fe Technologies), and Sig Hecker (Los Alamos).

"The Laboratory will exemplify a creative, learning organization that forms strategic partnerships with industry, government, and academia, and values integrity, excellence, and public service."

Sig Hecker,
Los Alamos National Laboratory

Forum participants had an opportunity to learn about more than 50 technologies available at Los Alamos by visiting the Sweeney Center's main room.





Atmospheric Aerosol Chemistry Analyzer

In their efforts to ensure worker and public safety, industry and government agencies for a long time have monitored for airborne hazardous metals in the workplace, in stack emissions, and in the air. The prevalent conventional technique is to collect particles by pumping air through filter paper for several hours. A technician then collects the filter paper and sends it to an analytical laboratory for analysis.

“The results of the analysis are usually available in several days,” said Gene Mroz, a staff member in the Chemical Science and Technology Division at Los Alamos. “This delay may be unacceptable in a potentially hazardous situation.”

Los Alamos has developed an instrument that provides continuous near-real-time analysis of metal composition and concentration of airborne particles. This instrument combines two technologies, an aerosol sampler and an analytical mass spectrometer. The instrument provides detection limits of less than 40 ng/m³ for most metals on the periodic chart; it can be optimized for particle sizes that range from 0.3 to 15 microns. In addition, it can be adapted to ambient or stack gas monitoring.

“This instrument provides atmospheric concentration data in near real time and continuously,” stressed Mroz. “It can be used to monitor incinerator gas stacks,

fugitive emissions from remediation sites, fossil fuel combustion, and urban air pollution. These are just a few examples of what this technology is capable of.”

Los Alamos is presently testing a prototype version of the atmospheric aerosol chemistry analyzer.

Los Alamos Helps Mexico Build Better Bricks

Last year, the United States embassy in Mexico asked Los Alamos for technical assistance in a new venture. The Mexican government sponsored a program to convert the small-scale brick-making industry to cleaner and more efficient fuels and to produce better quality bricks.

“I visited Ciudad Juarez to speak with politicians and health workers, as well as brick makers at some of the 400 kilns throughout the city,” said Karl Staudhammer, Deputy Group Leader of the Materials Research and Processing group. “We collected samples of their materials and brought them to Los Alamos for analysis.”

Researchers conducted an array of tests, including analyzing the starting materials, examining the brick microstructure, measuring the thermal behavior of the brick materials during heating, and measuring the overall mechanical properties of the fired bricks.

“These studies help us understand how we might improve the starting materials and control the firing process while at the

same time making a better brick,” said Kimberly Martin, a technical staff member in Staudhammer’s group. “For example, we found that some of the bricks were seriously underfired whereas others were almost melted. Overfiring wastes energy and underfiring yields low-strength bricks.”

To improve the firing process, Charles Grigsby, also in Staudhammer’s group, designed a new kiln. “This new design allows us to recirculate the hot exhaust gases from the top of the kiln and thus reduce the energy requirements to heat incoming air. We also can use the heat energy left in the bricks after firing to dry and preheat the next batch of bricks. The total energy savings should be approximately 60%.”

Los Alamos is presently working with a new brick-maker’s school that opened in Ciudad Juarez to train brick makers in marketing, health issues, economics, and environmental concerns.

“We very much appreciate the dedication and help given to us by the Los Alamos scientists,” said Guadalupe De La Vega, president and founder of the Mexican Federation of Private Health and Community Development Association, which operates the brick-maker’s school.

This school presented an Award of Appreciation to Los Alamos and its director, Sig Hecker, for their active and strong participation in helping to modernize the brick micro-industry in Mexico.

Workers in Mexico take advantage of a more energy-efficient kiln.



Polymer Filtration Attracts Industry

Present technologies that remove metal ions from waste streams are expensive and barely meet present Environmental Protection Agency discharge limits.

As regulations become more stringent, many of these processes (such as ion exchange and precipitation) will be less than effective.

To address this problem Los Alamos has developed a technology known as polymer filtration, which couples water-soluble polymers with ultrafiltration. Scientists use a homogeneous solution in which the polymer binds with metal ions; this process is many times faster than conventional ion exchange resins.

After the polymer binds to the metal ions, the polymer-metal association is filtered and concentrated using a method known as ultrafiltration. The resultant metal can be recycled and the water meets all regulatory requirements. Furthermore, this process does not produce additional waste.

“One of the advantages of polymer filtration is that it can selectively strip metal from a waste stream,” noted Michael Cournoyer, a staff member in the Chemical Science and Technology Division at Los Alamos. “Conventional technologies such as precipitation, evaporation, and reverse osmosis cannot do this.”

This technology has multiple applications in the waste management and waste minimization arenas. For example, more than 10,000 metal-finishing shops could stand to gain from this technology. Los Alamos recently performed a large-scale demonstration of this technology at Boeing Aerospace, one of the largest electroplating facilities in the United States.

Los Alamos is presently working with industry to commercialize polymer filtration for electroplating applications. Other potential markets for it include the precious metal industry (for example, to recover silver), the textile industry, and the mining industry (for example, in mine drainage).



Michael Cournoyer prepares a polymer filtration experiment.

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Los Alamos Improves Plasma Efficiency

Plasma Technology, Inc., a small business operating out of Santa Fe, New Mexico, developed a plasma torch that destroys and recycles in an environmentally friendly manner industrial waste, toxic material, and spent munitions. Unfortunately, the torch's efficiency was approximately 10%. For the technology to be cost-effective and attractive to users, it requires an efficiency of at least 30%.

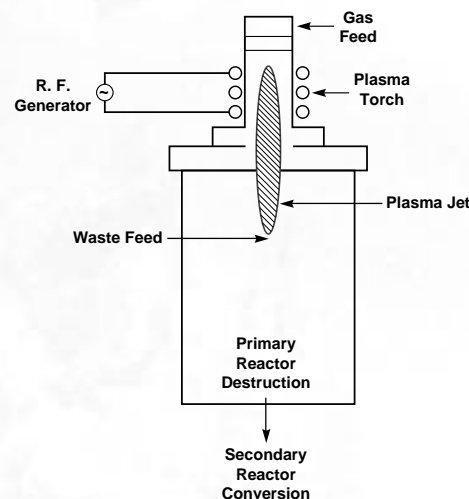
To help address this problem, Plasma Technology, Inc., established a Cooperative Research and Development Agreement (CRADA) with Los Alamos. With the CRADA in place, Michel Tuszewski, a staff member of the Physics Division at Los Alamos, created a theoretical model of the company's existing torch. Using this model, he proposed modifications that helped to raise the torch's efficiency to approximately 30%.

"The best part of this CRADA was to have access to someone like Michel, who could develop a model that would fit the previous trial and error testing we had done then turn around and project what we had to do next to improve the efficiency of the torch," said John Serino, President of Plasma Technology, Inc. "For a small company to have access to this kind of resource is incredibly expensive. We got a lot of value for the short time that was spent on it (the CRADA)."

Plasma Technology, Inc., and Los Alamos subsequently signed a second

CRADA to further improve torch efficiency. "I am now working to improve torch efficiency to 50%," said Tuszewski. "Nitrogen, oxygen, and steam are gases that, together with other torch design changes, could significantly improve efficiency."

This technology consists of an inductive plasma torch, a waste injection system, and two reactors. The destruction takes place in the primary reactor, the conversion in the secondary reactor. Plasma Technology, Inc., plans to deliver its first commercial unit in late 1995.



Los Alamos worked with Plasma Technology, Inc., to improve the efficiency of the company's plasma torch.

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